

THURSDAY, AUGUST 4, 1887.

THE JUBILEE OF THE ELECTRIC TELEGRAPH.

IT is something to have lived to take part in an epoch-making event. Many monarchs have celebrated their jubilees: printing, steam, gas, have passed through this period in silence and disregard, but the first practical application of electricity has commemorated the fiftieth anniversary of its birth with an *éclat* and success that reflect the highest credit on the managers of the banquet who brought together such a distinguished gathering on July 27.

It is remarkable that of all who were present not one took part at the birth of the electric telegraph. The pioneers are gone, and their memory was silently toasted. Of those associated with Cooke, William Watkins, who carried out his early experiments, and who put up the first overhead wires between Paddington and Slough, alone remains, but the inexorable duties of the law compelled his attendance on a special jury at Exeter on the day when he ought to have been present at the Holborn Restaurant. No collaborateur of Wheatstone in his early work exists. John Greener, who had charge of the telegraph on Bidder's celebrated rope railway between Fenchurch Street and Blackwall in 1842, was there, and many like Henry Weaver and J. R. France can date their telegraphic career from the incorporation of the first telegraph company in 1846.

One of the most interesting features of the meeting was the gathering around Mr. Edwin Clark of his old lieutenants. Edwin Clark's reforms in the early days of telegraphy (1850-54) still bear fruit. The footprints on the sands of telegraphic time are nowhere so deeply impressed as on the ground traversed by Clark. His mode of insulation, his underground work, his instruments, his test-boxes, still remain a type of English telegraphy everywhere. His work was well carried out by his brother and successor, Latimer Clark, and it is continued even in the present day by his pupil, Preece.

The success of telegraphy in this country is due essentially to the superposition of scientific method on to the rude rules of practice. The rule-of-thumb principles of the early engineers were inoperative in telegraphy, for the exact laws of Ohm, Ampère, and Coulomb, the experimental skill of Faraday, Joule, and Grove, the mathematical genius of Helmholtz, Thomson, and Maxwell, have kept our electricians in the straight path, and prevented them from wandering in the wilds of guess-work and in the labyrinth of tentative troubles. It is impossible to say how much this influence has been reflective. The science of electricity has been indebted as much to practice as practice has been indebted to science. Submarine telegraphy chronicles no failure. The first Atlantic cable raised the curtain. The conditions were evident. Thomson stepped in, and all was light.

To telegraphy "all the world's a stage." The inventor has no nationality. Alongside of Wheatstone we find Morse and Siemens, Meyer, Hughes, and Edison, La Cour, Varley, Leclanché, and Minotto. This polyglottism is seen in the nomenclature of the units of

VOL. XXXVI.—NO. 927.

measurement, ohm, farad, ampere, and coulomb, the only universal system of measurement, excepting that of time, extant.

Telegraphy, without which railway traffic would be impossible, has followed the growth of railways, and it has revolutionized the procedure of commerce. Hence the great commercial nations, England and the United States, show the greatest development of its progress.

One regretted to hear so little said about the great commercial spirits who set the ball a-rolling. John Pender, Cyrus Field, Tom Crampton, deserve all that was said of them, but where were Ricardo and Scudamore in England, Orton and Vanderbilt in America?

The story as told by the Postmaster-General reads like a romance of fairyland. The first five-needle instrument of Cooke and Wheatstone required five wires to transmit at most five words a minute: now five wires can transmit 2500 words in the same time.

We can pride ourselves in England on being in advance of all other nations not only in the development of the business of telegraphy, but also in the invention and perfection of apparatus. It is something to have in ten years increased the capacity of the wires for the transmission of messages *tenfold*, and to have done that without patent, or any reward but the consciousness of having done well. Government officials are unfortunately placed in this respect. It is improper to patent an invention developed in the discharge of duty, while they are singularly liable to be assailed by the daily Press for their supposed shortcomings. The work they do is only known by their own writings, when they are allowed to write; and even then they are subject to unfair and dubious criticism. The Press takes no trouble to find out what is done. The feeling is, "What good can come out of Nazareth?" Yet the introduction into the Post Office system of high-speed repeaters and of shunted condensers marks two epochs as successful, eventful, and meritorious as the introduction of duplex, of quadruplex, or of multiplex working. We were told that the rate of working between London and Dublin had gone up from 50 to 462 words a minute. *One* cable will do the work of *ten*. What has been the reward? We venture to say, *nothing*; and that the Lords of the Treasury are profoundly ignorant of the good work that is being done in the service over which they preside—work which they are just as likely to reward with a kick as with a half-penny.

The jubilee is now over, and we have every reason to feel proud that Mr. Raikes, the present Postmaster-General, Sir Lyon Playfair and Mr. Shaw-Lefevre, his predecessors, had such excellent tales to tell, and so gracefully assisted at so successful a gathering.

THE CLASSIFICATION OF ALGÆ.

Till Algernes Systematik. Nya bidrag af J. G. Agardh. (Femte afdelningen.) Transactions of the University of Lund, Tom. XXIII., 4to, pp. 180, 5 plates.

THE indefatigable Dr. Agardh has recently issued the fifth instalment of his work on the systematic classification of Algæ. Although it bears a Swedish title, the work is in Latin. The subject treated is the interesting group of the Siphonæ.

Dr. Agardh mentions that but few observations have

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been made upon the fruit of the Siphonæ; but the little that is known on this subject proves that great differences exist in the fructification of these Algæ. Thus the organs of reproduction in *Vaucheria* differ from those of *Botrydium*, while those of the latter vary from those of *Bryopsis*, *Codium*, *Dasycladus*, and *Acetabularia*. Of many other genera observations are deficient or in various respects uncertain and inconclusive. For interesting general remarks on the fructification of the Siphonæ the reader is referred to page 10, and for special details to the observations on each genus and on the fruit of such of the species as are best known.

Setting aside the true characteristics of the fruit, it becomes a question by what characters of the structure the Siphonæ are to be distinguished from the *Conferveæ* and *Ulvaceæ*, and their affinities determined. In Dr. Agardh's opinion these characters are to be found in the filaments or utracles of the frond, being tubular, and not, as in the *Conferveæ* and *Ulvaceæ*, consisting of subdivided cells. Good examples of the former are afforded by *Caulerpa* and *Valonia*, whose fronds, roots, stems, branches, and ramuli, though distinct, consist of a single cell. These remarks are followed by observations on the comparative structure in different genera and their affinities with each other.

With the exception of *Vaucheria* and *Botrydium*, says Dr. Agardh, the Siphonæ inhabit the sea. This is unquestionably the case as regards *Botrydium*, but it may be asked whether it be quite true as to *Vaucheria*, several of the British species of which are recorded by Dr. Nordstedt ("Remarks on British Submarine *Vaucheria*," Lund, 1886) as growing at the lowest tide-marks, and one species (*V. piloboloides*, "probably in quite salt water." The greater number of the Siphonæ are natives of the warmer seas, and are especially abundant on the shores of rocky islands of which the principal constituent is lime. They spread their fibrous roots among the sandy *débris*, and are thus useful in holding together the particles of sand.

Some of the Siphonæ have creeping stems, as have the *Caulerpeæ*. These plants, by extending the network of their creeping stems and roots over the sand, seem to exercise on the coast, within tide-marks, the same functions as the *Maram* (*Psamma arenaria*). This plant grows on the coast of Norfolk, and is found so useful in holding together the particles of sand, and thus aiding in the formation of land and preventing the inroads of the sea, that strict regulations are in force to prevent its destruction. In the same manner as the *Maram* spreads over the dry sands, the *Caulerpeæ* extend on the sea-shore within tide-marks, and are thus uncovered at low water. When the tide is out, they resemble green meadows. The utility of these plants in protecting the land was, a few years ago, unexpectedly proved in the neighbourhood of Adelaide, South Australia. A farmer suffered his sheep to stray upon the coast where the *Caulerpeæ* were exposed at low water. The sheep devoured the Algæ; the sea consequently broke in and established itself, and land was thus permanently lost. Many species, as *Halimeda* and *Penicillus*, have roots which are occasionally as large as small hens' eggs, formed of innumerable branched fibres which penetrate deeply into the sand. Some of the stipiform species emit flagelliform creeping "propagula," from which spring new

plants; hence, observes Dr. Agardh, the Siphonæ may be said to be social plants. Some Algæ, as *Anadyomene*, grow in shallow water exposed to the full influence of light, while others, like *Bryopsis*, prefer deep water to which light scarcely penetrates.

Many, but not all, of the Algæ belonging to the Siphonæ have, like the *Corallina* family, the power of absorbing lime from the water. Young plants are generally green, but the incrustation of lime, in certain species, increases with age. In some genera it is entirely absent, as in *Codium*; in others it is extremely slight; while in some species of *Halimeda* the whole frond is frequently cased with a hard coating of lime, and looks like a gigantic frond of *Corallina*.

The disposition of the families of which the Siphonæ are composed must be attended with some difficulty until the fruit is more perfectly known. In the interim Dr. Agardh proposes the arrangement adopted in the work. The group has been considerably enlarged, including as it now does the *Dasycladeæ* and *Valoniaceæ*. With regard to the former, the author observes that the *Dasycladeæ* are quite distinct from all the other genera, with their verticillate stems and external sporangia; hence he considers that they undoubtedly form a natural family. The fructification nevertheless varies in different genera.

There appears no doubt as to the limits of the *Caulerpeæ*. These are set forth in the first part of the present work ("Till Algernes Systematik"), and, although some observations are still wanting as to the fructification, the *Caulerpeæ* form a very distinct family.

The limits of the *Valoniaceæ* are very difficult to determine. In the form and size of their cells they for the most part are very near the *Caulerpeæ*. They are little more than ramulose proliferations; hence the ramification, although it is in some species more or less obscured, may be said to have a common character. But little is known of the fruit of these plants. In some genera the structure varies from that of the other *Valoniæ*, and approaches near to that of *Ulva*, as may be seen in *Dictyosphæria* and *Anadyomene*.

Among the remaining genera are some whose fronds consist almost entirely of compound tubes incrustated with lime. In these the normal ramification is di-trichotomous, but in *Bryopsis* and *Codium*—which, however, are not coated with lime—it may be said to be pinnate. Of the fructification of these plants few observations are recorded. In *Udotea Desfontainsii* and *Halimeda tuna*, true sporangia have been observed. Both belong to the *Udoteaceæ*. Whether the *Spongodieæ*, with their *quasi*-composite fronds, and the *Bryopsidææ*, with their free filaments, should be separated from each other, or united into one family, may be subject for consideration.

Vaucheria and *Botrydium* are not treated in the present work: neither does Dr. Agardh know to which family of the Siphonæ they should be attached.

The whole group, in which the *Dasycladeæ* and *Valoniaceæ* are now included, is thus arranged by Dr. Agardh:—

I. BRYOPSIDÆÆ.

- (1) *Bryopsis*; (2)? *Derbesia*.

II. SPONGODIÆÆ.

- (3) *Codium*, ?? *Cladethele*.

III. UDOTACEÆ.

- (4) *Chlorodesmis*; (4a) ? *Avrainvillea*; (5) *Espera*; (6) *Penicillus*; (7) *Rhipocephalus*; (8) *Callipsygma*; (9) *Udotea*; (9a) ? *Rhipidosiphon*; (10) *Halimeda*.

IV. VALONIACEÆ.

- (11) *Valonia*; (12) *Siphonocladus*, ? *Ascothamnion*, ? *Trichosolen*; (13) *Apjohnia*; (14) *Struvea*; (15) *Chamædoris*; (16) *Dictyosphaeria*; (17) *Anadyomene*.

V. CAULERPEÆ.

- (18) *Caulerpa*.

VI. DASYCLADEÆ.

- (19) *Dasycladus*; (20) *Chlorocladus*; (21) *Botryophora*; (22) *Cymopolia*; (23) *Neomeris*; (24) *Bornetella*; (25) *Halicoryne*; (26) *Polyphysa*; (27) *Acetabularia*, ? *Pleiophysa*.

It will be observed that the position of *Derbesia*, *Cladothele*, *Avrainvillea*, *Rhipidosiphon*, *Ascothamnion*, and *Trichosolen* are not yet finally determined. Neither does the author yet see his way to include *Chlorodictyon* (*Ast. Holm.* 1870, Öfversigt No. 5, p. 427, tab. iv.) in the present arrangement. *Codiolum* is also excluded. The genus *Balbisiana* is mentioned (p. 10) once, but is not again referred to. Has *Bryopsis Balbisiana* been formed into a distinct genus under this name?

Under *Avrainvillea* Dr. Agardh includes the *Fradelia* of Chauvin, the *Chloroplegma* of Zanardini, and the *Rhipilia* of Kützing. This genus has the habit of *Udotea*, a cylindrical stem, a coriaceous, flabellate frond, of a very dark colour, with lacerated apex, forming irregular lobes, in which the zones of *Udotea* are absent. Of the fruit nothing appears to be known.

Of *Rhipidosiphon* there is no description, and very little seems to be actually known about this Alga. To Dr. Agardh it appears to be a young plant of *Udotea*.

Our knowledge of *Ascothamnion* (*Valonia intricata*, C. Ag.) is very limited, although the plant has been found in most of the warmer seas.

Trichosolen is a native of the Antilles, where it was found by Montagne. With *Pleiophysa* Dr. Agardh is acquainted only through Kützing's figure (*Tab. Phyc.*, vol. xvi. tab. 1). The habit and form of the sporidia agree with those of *Halicoryne*.

Penicillus Phoenix now appears as *Rhipocephalus Phoenix*. The new genus *Callipsygma* is founded on an Australian Alga which bears a certain resemblance to the last-mentioned plant. The former has an undivided terete stem incrustated with lime, while in the latter the stem is two-edged, without incrustation, and from the margins issue pinnate ramuli. The fruit of both genera is unknown.

Chlorocladus is between *Dasycladus* and *Botryophora* = *Dasycladus occidentalis*. These three genera are especially distinguished from each other by their fruit.

Of the whole group of the Siphonæ three genera only have representatives on the British shores. These three genera are *Bryopsis*, *Derbesia*, and *Codium*. They have all a wide range. Of the nineteen species of *Bryopsis*, two are natives of these shores. *Derbesia* ranges from the Adriatic to the Faroe Isles and Norway. Dr. Agardh does not seem to be aware that *D. tenuissima* has been found on the British coast. Although *Codium* has so extensive a range, no species has yet been recorded from

the east coast of the United States. That remarkable plant, *C. bursa*, which is found on the southern coast of Britain, the Mediterranean and Adriatic, has recently been obtained from Victoria, Australia. On the Sussex coast it may sometimes be picked up after storms. Its range in depth of water is about the same as that of *Ryti-phleæ pinastroides*, with fragments of which, when hollow and torn, the frond is sometimes filled. *Sphacelaria plumula* grows on it occasionally. Dr. Agardh mentions that three or four fronds often grow together. The writer possesses a specimen from Brighton, which consists of a group of ten fronds, one of which is fixed to a piece of chalk; the others grow upon one another, a few filaments attaching the young plants to the older ones. In 1870 the Rev. E. S. Dewick was fortunate enough to pick up a specimen at Eastbourne, which, on examination, proved to be in fruit. He stated at a meeting of the Eastbourne Natural History Society (November 18, 1870) that "the Coniocytae are produced on the outer surface of the clavate filaments, and differ from those of *C. tomentosum* only in being nearer the top of the filaments, and smaller in proportion to their size."

Codium tomentosum was reputed to be nearly cosmopolitan. Dr. Agardh, however, shows that several species have been included under this name, and that the so-called Australian forms belong to *C. Muellieri*, *C. Galeatum*, and *C. mucronatum*. In the last two species the utricle is mucronate, as represented in Plate 1, Figs. 1, 2, 3. *C. elongatum*, in which the frond, instead of being cylindrical, as in *C. tomentosum*, is compressed, is recorded by Dr. Agardh from Ireland. This fact is worthy the attention of British algologists. *C. latum*, found by M. Suringar on the coast of Japan, is not referred to in Dr. Agardh's work, neither is the plant, apparently allied to *Codium*, called by M. Suringar *Acanthocodium* (see "Alg. Jap.," p. 23). This also is a native of Japan, and probably but very little known.

Although so many points in the history of the Siphonæ are still undetermined, this work of Dr. Agardh's will be found full of interest and instruction.

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AMERICAN MINING INDUSTRIES.

Report on the Mining Industries of the United States (exclusive of the precious metals.) By R. Pumpelly, 4to, pp. xxxviii.-1025. (Washington: Government Printing Office, 1886.)

THIS, the fifteenth and final volume of the Reports illustrating the results of the census of the United States taken in 1880, is in great part devoted to descriptions of the principal districts producing iron ores in the United States, the condition of the mines during the census year being studied in considerable detail, and in many cases illustrated by sketches of the workings. A very large number of samples of the ores of the different mines were collected by specially appointed agents, who visited every district and almost every mine of importance, and these were examined by a chemical staff at a special laboratory at Newport, Rhode Island. It was originally intended to make complete analyses of the greater number of the 1400 samples so collected, but the early exhaustion of the funds voted for the census necessitated an extensive